CLAIMS

1. An HLA class II molecule comprising a DP beta chain, wherein the DP beta chain comprises an amino acid other than valine at a position corresponding to amino acid residue 141 of SEQ ID NO: 1.

2. The HLA class II molecule of claim 1, wherein the DP beta chain further comprises an amino acid other than leucine at a position corresponding to amino acid residue 112 of SEQ ID NO: 1.

3. The HLA class II molecule of claim 1 or 2, wherein the DP beta chain comprises an amino acid sequence having at least about 80% sequence identity to an amino acid sequence selected from SEQ ID NOs: 1, 3, 4, and 5.

4. The HLA class II molecule of claim 2 or 3, wherein the amino acid other than leucine at a position corresponding to amino acid residue 112 of SEQ ID NO: 1 comprises a hydrophobic side chain.

5. The HLA class II molecule of claim 4, wherein the amino acid other than leucine at a position corresponding to amino acid residue 112 of SEQ ID NO: 1 is selected from the group consisting of an alanine, a valine, an isoleucine, a methionine, a phenylalanine, a tyrosine, and a tryptophan.

6. The HLA class II molecule of any one of claims 1 to 5, wherein the amino acid other than valine at a position corresponding to amino acid residue 141 of SEQ ID NO: 1 comprises a hydrophobic side chain.

7. The HLA class II molecule of claim 6, wherein the amino acid other than valine at a position corresponding to amino acid residue 141 of SEQ ID NO: 1 is selected from the group consisting of an alanine, an isoleucine, a leucine, a methionine, a phenylalanine, a tyrosine, and a tryptophan.

8. The HLA class II molecule of any one of claims 1 to 7, wherein the DP beta chain comprises a tryptophan at a position corresponding to amino acid residue 112 of SEQ ID NO: 1 and a methionine at a position corresponding to amino acid residue 141 of SEQ ID NO: 1.

9. The HLA class II molecule of any one of claims 1 to 8, wherein the DP beta chain comprises the amino acid sequence set forth in any one of SEQ ID NOs: 1, 3, and 4.

10. The HLA class II molecule of any one of claims 1 to 9, further comprising a DP alpha chain.

11. The HLA class II molecule of claim 10, wherein the DP alpha chain comprises an amino acid sequence having at least about 80% sequence identity to SEQ ID NO: 6 or 8.

12. The HLA class II molecule of claim 11, wherein the DP alpha chain comprises the amino acid sequence set forth in SEQ ID NO: 6 or 8.

13. The HLA class II molecule of any one of claims 1 to 12, which is a DP1, DP2, DP3, DP4, DP5, DP6, DP8, or DP9 allele.

14. The HLA class II molecule of any one of claims 1 to 13, wherein:

    (a) the DP beta chain has an increased affinity for a CD4 protein as compared to a reference HLA class II molecule, wherein the reference HLA class II molecule comprises a DP beta chain comprising (i) a leucine at a position corresponding to amino acid residue 112 of SEQ ID NO: 1 and/or (ii) a valine at a position corresponding to amino acid residue 141 of SEQ ID NO: 1;

    (b) the DP beta chain is bound to a membrane of a cell;

    (c) the DP beta chain comprises an extracellular domain of a full length DP beta chain;

    (d) the DP beta chain is linked to or associated with an inert particle;

    (e) the DP alpha chain comprises a signal peptide;

    (f) the HLA class II molecule further comprises a DP alpha chain bound to a membrane of a cell;

    (g) the HLA class II molecule further comprises a DP alpha chain comprising an extracellular domain of a full length DP alpha chain; or

    (h) any combination of (a)-(g).

15. A nucleic acid molecule encoding the HLA class II molecule of any one of claims 1 to 14.

16. A vector comprising the nucleic acid molecule of claim 15.

17. A cell comprising the HLA class II molecule of any one of claims 1 to 14, the nucleic acid molecule of claim 15, or the vector of claim 16.

18. A method of identifying a T cell receptor capable of binding an epitope in an MHC class II complex, comprising

    (a) pulsing the cell of claim 17 with one or more peptide comprising the epitope, and

    (b) stimulating one or more $CD4^+$ T cell with the pulsed cell.

19. Use of the HLA class II molecule of any one of claims 1 to 14 in the manufacture of a medicament for treating a disease or condition in a subject in need thereof.

20. A complex comprising:

    (a) the HLA class II molecule of any one of claims 1 to 14 and

    (b) a peptide, wherein the peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 32-237.